DOCUMENT RESUME

ED 428 651 IR 019 312

AUTHOR Basque, Josianne; Rocheleau, Johanne; Paquette, Gilbert; Paquin, Chantal

TITLE An Object-Oriented Model of a Computer-Enriched High School.
PUB DATE 1998-06-00
NOTE 7p.; In: ED-MEDIA/ED-TELECOM 98 World Conference on Educational Multimedia and Hypermedia & World Conference on Educational Telecommunications. Proceedings (10th, Freiburg, Germany, June 20-25, 1998); see IR 019 307.
PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Computer Uses in Education; *Decision Making; Educational Planning; Educational Technology; Foreign Countries; High Schools; Information Technology; Instructional Design; *Instructional Development; Models; Telecommunications
IDENTIFIERS Learning Environments; Object Orientation; *Process Models; Quebec; *Technology Implementation

ABSTRACT

This paper describes the work in progress of a research team at LICEF Research Center, Tele-universite (Canada) in developing an object-oriented model of a computer-enriched high school, with the goal of bringing about a new vision of education through the use of technology. The model facilitates decision-making by offering a global and integrated view of various uses of technological tools in a flexible electronic format. The decision-makers in a school can use the model to plan short or long term information and communications technology implementation and to pinpoint processes, sub-processes, or tasks that should be given priority within the plan. Five figures illustrate a generic model and the four levels of the computer-enriched high school model: processes that contribute to achieving the school mission (level 1); the teaching process and its sub-processes (level 2); tasks of the sub-process, "planning the learning environment" (level 3); and actors and inputs/products related to a task (level 4). Contains 16 references. (DLS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 428 651

An Object-Oriented Model of a Computer-Enriched High School

Dr. Josianne Basque
Johanne Rocheleau
Dr. Gilbert Paquette
Chantal Paquin
Centre de recherche LICEF, Télé-université, 1001 rue Sherbrooke Est, C.P. 670, Succ. C, Montreal, Canada
Tel : (514) 522-3540, Fax : (514) 522-3608, E-mail : jbasque@teluq.uquebec.ca, jrochele@teluq.uquebec.ca, gpaquett@teluq.uquebec.ca, cpaquin@teluq.uquebec.ca

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
G.H. Marks
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

Abstract: Information and communication technologies offer new tools that can contribute to facilitate, enrich or help us to rethink the way teaching, learning and management activities are carried out in schools. This paper describes the work in progress of a research team at LICEF Research Center (Télé-université, Quebec, Canada) in developing an object-oriented model of a computer-enriched high school. This work is being carried out within an action-research project called *L'école informatisée Clés en main* ("The turnkey computer-enriched school").

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

1. Introduction

The implementation of information and communication technologies (ICT) in Quebec schools has been on-going since the 1980's. However, although several innovative instructional uses of technology have emerged, recent reports point out that Quebec schools still do not sufficiently take ICT into account [Berthelot 1994; Comité consultatif sur l'autoroute de l'information 1995; Conseil supérieur de l'éducation 1994; Conseil de la science et de la technologie 1994; Fournier & McKinnon 1994].

A variety of factors contribute to this situation, notably the lack of four elements essential to the successful integration of ICT in education: a systemic perspective; a long-term vision; consultation; and a clear school model facilitating the optimal use of ICT [Guidotti 1994]. In 1994, a research team from the LICEF Research Center (Télé-université) developed a systemic model of a computer-enriched high school as part of a project called *L'école informatisée Clés en main* ("The turnkey computer-enriched school"). The high school level was targeted because the educational use of ICT is not as widespread as at the elementary level [Bédard Hô 1994; Danvoye 1993]. The objectives of this project are to build a model of a computer-enriched high school and to develop an information technology implementation procedure that could serve as a framework for all Quebec high schools. This paper presents the work in progress regarding the model.

2. What Is a Computer-Enriched High School?

A computer-enriched high school implies more than simply the installation of cables, hardware and software. Rather, it implies a complete rethinking of the school in all its functions in light of the potential of ICT. It is not a matter of just introducing technology into the organization but rather of redefining the organization through the use of technology. This redefinition must focus on organizational processes, since a process crosses functional borders and is independent from the organizational structure [Bernier, Pinsonneault, Rivard & Blouin 1995]. Process reengineering allows us to take a new look at school processes. Process reengineering is a concept borrowed from industrial engineering and is an organizational design approach based on information technology [Aubert, Bouchard & Gingras 1995].

A school may be seen as an organization where different actors (students, teachers, non-teaching professionals, managers, parents, etc.) receive, consult, process, handle, produce and communicate information in order to accomplish various activities such as teaching, learning or managing [Rocheleau & Basque 1996].

IR019312

BEST COPY AVAILABLE

These processes are governed by a set of principles and can be carried out with tools such as job aids, hardware and software. ICT offer new tools that can contribute to facilitate, enrich or help us to rethink the way these processes are carried out.

3. How Is the Computer-Enriched High School Model Designed?

The model is designed according to the *object-oriented modeling* technique developed by the LICEF Research Center [Paquette 1996]. It uses a formalism according to which various object types are represented by specific graphic shapes, linked by arrows and a qualifier that give a meaning to each type of relation.[1]

Our model has three types of objects [see Fig. 1]:

- *Processes* (ovals). A process is a set of sub-processes and tasks that uses inputs and transforms them into products.
- *Actors* (hexagons) that are responsible for processes.
- *Inputs/products* (rectangles) include printed documents as well as hardware, software and data. Those tools are identified in a generic manner; examples of existing tools are provided so that each school may choose tools according to its specific needs and to keep pace with technological developments. Hence, it is a variable-geometry type of model.

Five types of relations may exist between objects:

- *is composed of* (C)
- *is input to/product of* (I/P)
- *precedes* (P)
- *is responsible for* (R)
- *is a sort of* (S).

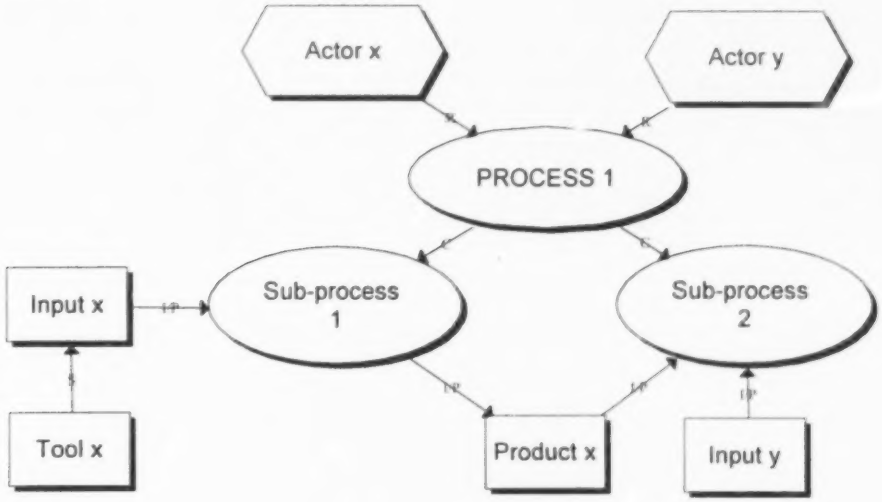

Figure 1: A generic model

An important principle in this modeling technique is the *inheritance* of the inputs and the products of the processes by sub-processes and tasks. Since the processes are specified from a hierarchical point of view (processes are composed of sub-processes; sub-processes are composed of tasks), they inherit the inputs and the products of the preceding level. This principle eliminates redundancy and increases the readability of the graphics.

---

[1] LICEF Research Center has also developed graphic editing software (MOT) for the object-oriented modeling technique. For further details on this product, refer to: http://**licef.teluq.uquebec.ca**

The model includes four levels:

- The first level [see Fig. 2] shows the four main processes that contribute to achieving the school mission: insuring student learning. These processes are: Teaching; Learning; Managing the school; and Insuring use of multimedia resources.

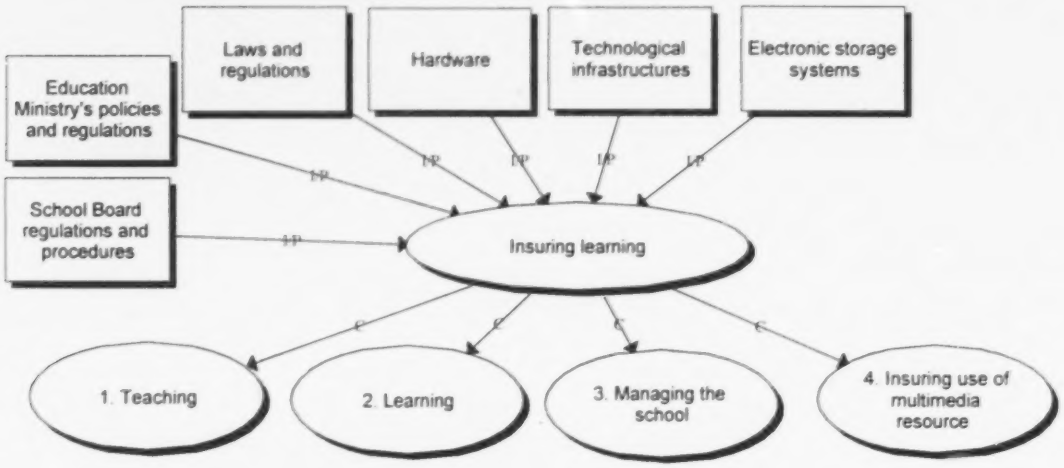

Figure 2: Processes that contribute to achieving the school mission (level 1)

- The second level [see Fig. 3] shows sub-processes that are linked to each of the four main processes. For example, the actor "Teacher" is responsible for the "Teaching" process. This process can be broken down into five sub-processes: Planning the learning environment; Organizing the learning environment; Implementing learning activities; Supervising the learning environment; and Assessing student learning.

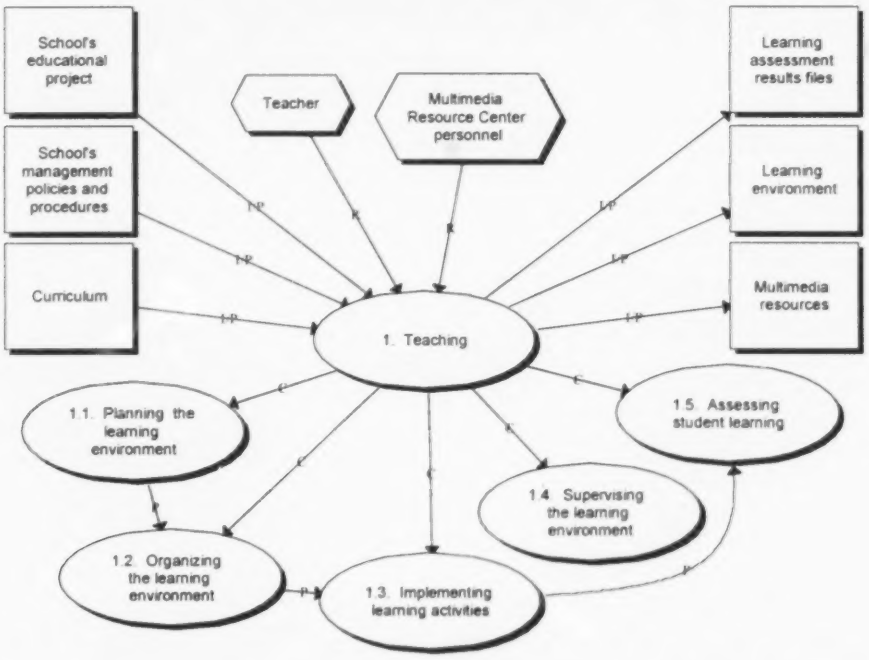

Figure 3: The "Teaching" process and its sub-processes (level 2)

BEST COPY AVAILABLE

- The third level [see Fig. 4] shows tasks related to each sub-process. For example, "Planning the learning environment" is broken down into four tasks: Planning learning activities; Planning instructional materials; Planning learning support infrastructures; and Planning assessment of learning.

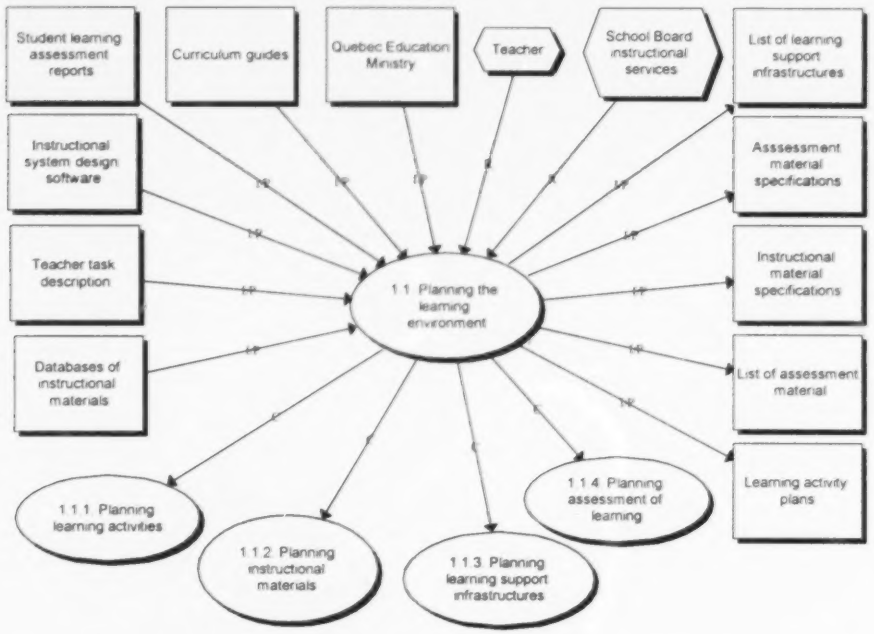

Figure 4: Tasks of the sub-process "Planning the learning environment" (level 3)

- The fourth level does not have any sub-processes. It shows only the actors and inputs/products related to each task [See figure 5 for an example].

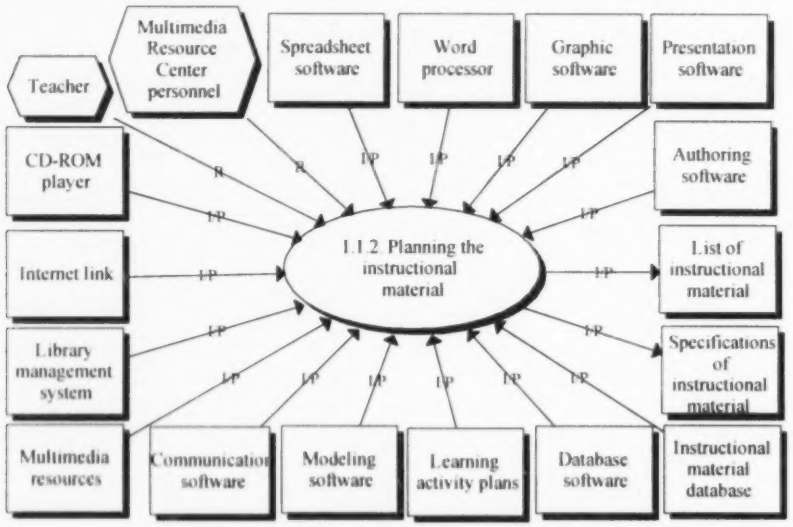

Figure 5: Actors and inputs/products related to a task (level 4)

While developing the model, computerized notecards were produced for each process. These notecards contain a definition of the process, one or several categories of actors who carry out this process, and a list of all inputs and products (including computer tools). They also provide more detailed information about principles that govern the use of computer tools within each school process. In addition, each category of tools has its own descriptive entry.

The model is based on a theoretical framework for each school process; the goal was to bring about a new vision of education through the use of technology. The main principles enunciated in the theoretical frameworks [Basque, Rocheleau & Winer 1998; Michaud & Rocheleau 1998; Rocheleau 1998] are:

- Cognitivist and constructivist learning approaches for the *Teaching* and *Learning* processes;
- Systemic management and learning organization principles for the *Managing the school* process;
- A resource-based pedagogical approach for *Insuring use of multimedia resources.*

The model and notecards are based on readings about ICT educational integration as well as from action research in two Quebec high schools. The action research project enables us to both support and observe changes as they occur in schools integrating ICT into all aspects of their activities [Basque, Rocheleau & Chomienne 1996]. This information was used to build the model.

4. Conclusion

This model does not remove the school's responsibility in making technological choices; however, it facilitates decision-making by offering a global and integrated view of various uses of technological tools, in a flexible electronic format.

The decision-makers in a school can use the model to plan short or long term ICT implementation and to pinpoint processes, sub-processes or tasks that should be given priority within the plan. They can also obtain a portrait of a particular tool's possible uses across the four processes in order to make a strategic choice among existing tools.

5. References

[Aubert, Bouchard and Gingras 1995] Aubert, B.A., Bouchard, L., & Gingras, L. (1995). La RPA: vision globale et rôle des technologies de l'information. *Gestion*, 20(2), 56-62.

[Basque, Rocheleau and Chomienne 1996] Basque, J., Rocheleau, J., & Chomienne, M. (1996). Le projet École informatisée clés en main: pourquoi et en quoi une recherche-action? In G. Puimatto and R. Bibeau (eds.), *Comment informatiser l'école* (pp. 93-112). Montréal/Paris: Publications du Québec/ CNDP.

[Basque, Rocheleau and Winer 1998] Basque, J., Rocheleau, J., & Winer, L. (1998). *Une approche pédagogique pour l'école informatisée.* Montréal: L'école informatisée Clés en main du Québec inc.

[Bédard Ho 1994] Bédard Ho, F. (1994). *À l'ère des technologies de l'information à l'école - Revue de littérature.* Québec : Ministère de l'éducation du Québec.

[Bernier, Pinsonneault, Rivard and Blouin 1995] Bernier, C., Pinsonneault, A., Rivard, S., & Blouin, H. (1995). La réingénierie: un processus à gérer. *Gestion*, 20(2), 44-55.

[Berthelot 1994] Berthelot, M. (1994). *L'évolution de la micro-informatique scolaire au cours des dix dernières années.* Québec : Conseil supérieur de l'éducation.

[Comité consultatif sur l'autoroute de l'information 1995] Comité consultatif sur l'autoroute de l'information (1995). *Inforoute Québec: Plan d'action pour la mise en oeuvre de l'autoroute de l'information.* Sainte-Foy: Conseil de la science et de la technologie.

[Conseil de la science et de la technologie 1994] Conseil de la science et de la technologie (1994). *Miser sur le savoir. Rapport de conjoncture 1994, 2e volet: Les nouvelles technlogies de l'information.* Sainte-Foy: Conseil de la science et de la technologie.

[Conseil supérieur de l'éducation 1994] Conseil supérieur de l'éducation (1994). *Rapport annuel 1993-94 sur l'état et les besoins de l'éducation. Les nouvelles technologies de l'information et de la communication: des engagements pressants.* Québec: Les Publications du Québec.

[Danvoye 1993] Danvoye, P. (1993). *Le parc de micro-ordinateurs utilisés dans l'enseignement en 1992-1993 - Résultats de l'enquête menée en mai et juin 1993.* Montréal : Ministère de l'éducation du Québec.

[Fournier and MacKinnon 1994] Fournier, L., & MacKinnon, K. (1994). *Les possibilités éducatives de l'autoroute de l'information au Canada: utilisation et instauration des technologies de l'information et communications en éducation.* Ottawa: Direction du développement des communications, Industrie Canada.

[Guidotti 1994] Guidotti, J. (1994). *Rapport d'entrevues sur l'intégration des nouvelles technologies aux activités des écoles secondaires.* Montréal: Ministère de l'Éducation du Québec.

[Michaud and Rocheleau 1998] Michaud, P., & Rocheleau, J. (1998). *Une approche d'exploitation des ressources documentaires pour une école informatisée.* Montréal: L'école informatisée Clés en main du Québec inc.

[Paquette 1996] Paquette, G. (1996). La modélisation par objets typés - une méthode de représentation pour les systèmes d'apprentissage et d'aide à la tâche. *Sciences et techniques éducatives,* avril.

[Rocheleau et Basque 1996] Rocheleau, J. & Basque, J. (1996). Modèle préliminaire de l'école informatisée. In G. Puimatto and R. Bibeau (eds.), *Comment informatiser l'école* (pp. 289-307). Montréal/Paris: Publications du Québec/ CNDP.

[Rocheleau 1998] Rocheleau, J. (1998). *Une approche de gestion scolaire pour une école informatisée.* Montréal: L'école informatisée Clés en main du Québec inc.

Acknowledgements

The authors wish to thank the participants from the two pilot Quebec schools (École secondaire de la Pointe-aux-Trembles and École polyvalente Saint-Jérôme). In addition, over thirty partners from Government, research centers, private industry and education are also involved in this project, which is partly subsidized by *Fonds de l'autoroute de l'information* and by Canada's *SchoolNet*. Our thanks also go to Lise Damphousse and Laura Winer for helping with the translation.